An Auditable Performance Based Software Acquisition Process

On-Time Quality

Systems & Software Technology Conference 2010
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Stewart- Priven Overview

30+ years software development Industry experience (each)

- Commercial, Executive Management Focus
- Government, Program Management & Technical Focus

Managed IBM team that developed Inspections

Both taught Inspections for Michael Fagan 1998 – 2005

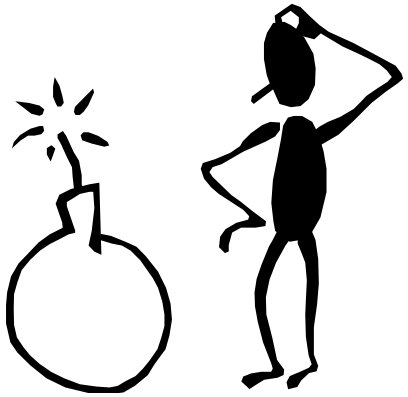
- 250 classes, 5,000 inspection practitioners, 50 company locations

Stewart-Priven Group - publications, presentations (www.stewart-priven.com)

- CrossTalk Journal, Jan. 2008 – 'How to Avoid SW Inspection Failure'(*10 Pitfalls*)
- CrossTalk Journal, Mar. 2009 – 'Mgt. Insp. Responsibility & Tools for Success'
- Plenary speakers at 2009 Systems & Software Technology Conference
- Project Mgt. Institute/Military Health Systems Oct. 2009 'SW Inspection Success'
- 2010 article 'An Auditable Performance Based SW Acquisition Process'

Agenda

- Government Software Acquisition Problems



- A Solution*

*****2010 article www.stewart-priven.com

Errors, Vulnerabilities, Missed schedules, Reduced content

Focus of general session opening at last year's SSTC on April 20th 2009

Lieutenant General L. William Shelton; U.S. Air Force
- Chief of Warfighting Integration and Chief Information Officer
- Assistant Vice Chief of Staff and Director Air Force Staff Headquarters

" CMMI Level 5 projects also experiencing these problems"

Later in the conference:

Karl Rogers – SSTC host and Director of 309th Software Maintenance Group

Bruce Weimer - Army Software Engineering Center, SSTC April 22, 2009
- 'Software Quality Assurance, Early and Continuous throughout the Life Cycle'
- 'Justifiable evidence and high confidence that your system performs as expected, when expected, is safe, and is secure'

also addressed these problems

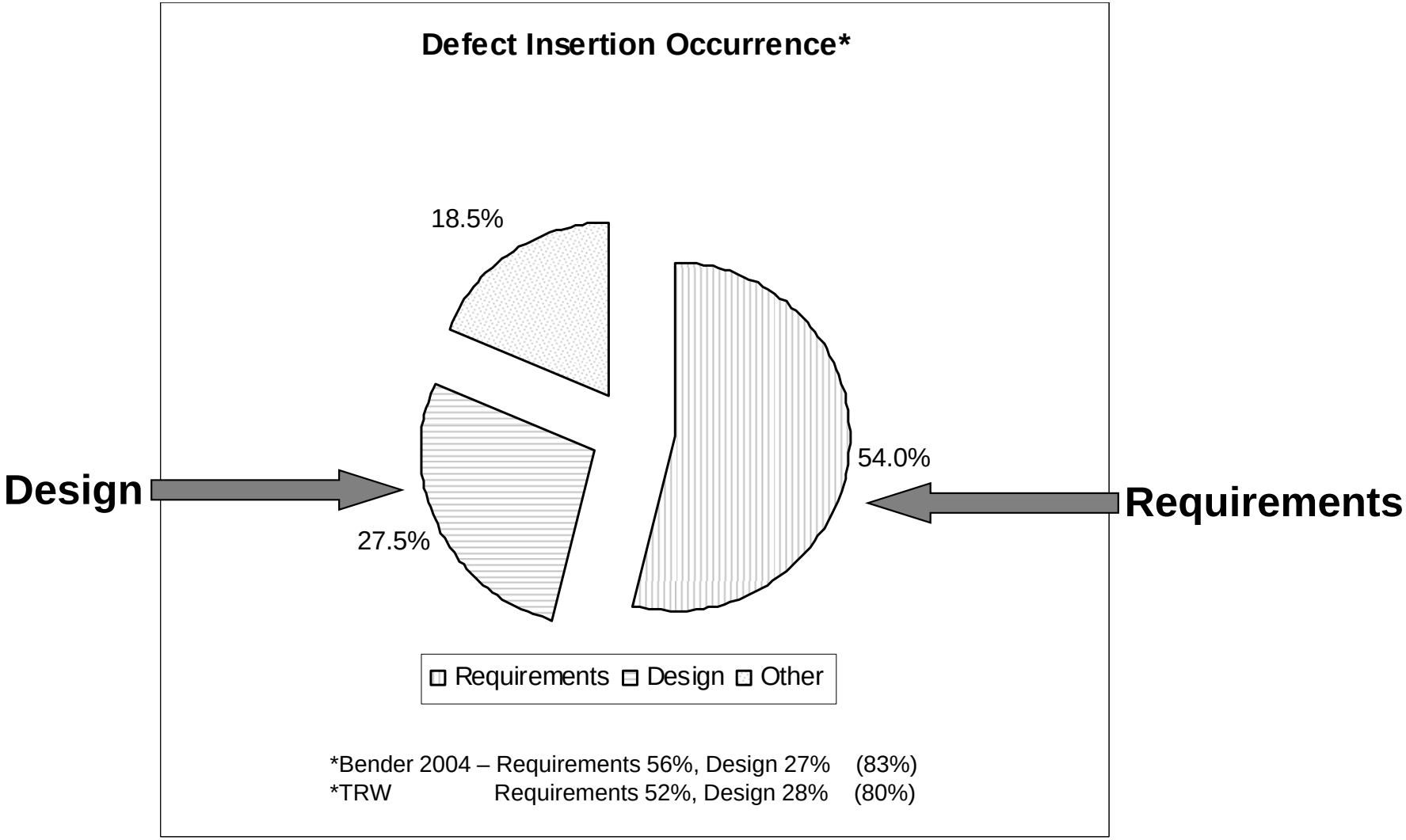
DoD/DHS* SwA Acquisition Working Group

- *"acquisition officials continue to accept software riddled with errors and other security vulnerabilities"*
  - The Software Assurance (SwA) Acquisition Working Group. "Software Assurance in Acquisition: Mitigating Risk to the Enterprise." October 22, 2008

- *"Software vulnerabilities, malicious code, and software that doesn't function as promised pose a substantial risk to the Nation's software-intensive critical infrastructure that provide essential information and services to citizens"*
  - The Software Assurance (SwA) Acquisition Working Group. "Software Assurance in Acquisition: Mitigating Risk to the Enterprise." October 22, 2008

* DoD – U.S. Department of Defense
* DHS – U. S. Department of Homeland Security

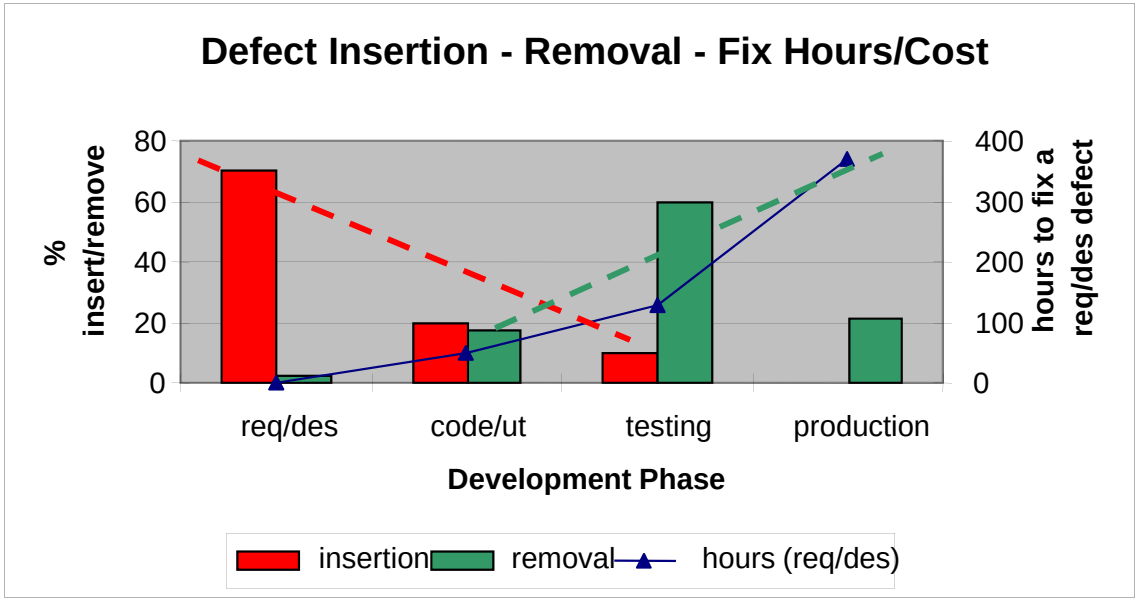
Defect (error) Insertion



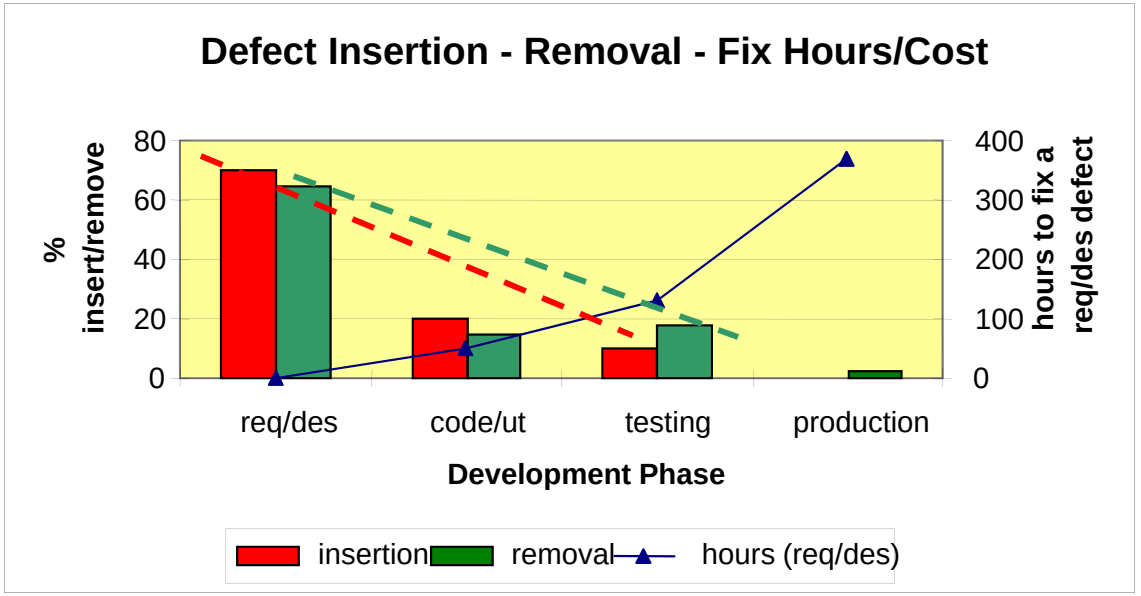
- Supplier focus on code-oriented defect removal approaches is <u>not sufficient</u>
  – e.g., Code Analyzers, Auto-Testing, Traditional Testing

Defect Removal Consequences

Without planned early defect removal ■ (typical)
- Schedule erodes
- Quality declines
- Cost escalates
- Code analyzers not effective for Req & Des



With planned early defect removal ■ (e.g., *effective* Inspections)
- Defect leaks contained
- Quality is high
- Rework cost minimized
- Schedule contained



CMM / CMMI / ISO 9x / etc.

- Predictors of Success
- Reflect what should be done during development,
- Don't examine outputs of development efforts
- Necessary, but not sufficient proof of:
  - What will be done
  - What has been done correctly

Report of the Defense Science Board Task Force. "Mission Impact of Foreign Influence on DoD Software.' Sept. 2007

- *"Process Assessments by themselves do not examine the outputs of any development effort and are therefore silent with respect to the quality attributes of any particular product."*
- *"A positive Process Assessment finding lowers the risk that an organization will produce a low quality product but the [actual] quality of the product itself must be assessed using other methods."*

SOLUTION to Acquiring Software On-Time with Higher Quality

- Performance Based Software Acquisition – discussed since 1991

- Modified concept needed: Based upon existing Standards

- Concept Overview:
  1. Candidate suppliers identify specific capabilities during RFP bid process
     - Acquirer (e.g., Govt.) Go/No-go
  2. Supplier capabilities then verified by Acquirer's Expert as part of bid process
     - Acquirer Go/No-go
  3. Supplier must demonstrate capability to produce ongoing, actionable and auditable justifiable evidence throughout contract performance
     - Acquirer Go/No-go before contract award
  4. Post-award performance monitoring, throughout development

What makes this concept feasible today?

Recently Available Technologies Enabling Auditable Performance Based Software Acquisition

- ‘IEEE Std. 1028™-2008 for Inspections’ (section 6)
  - Released August 2008
  - Significant upgrade from previous 1997 version
  - Clarifications, Completeness, Inspection Roots

- Computerized tools for Inspection Planning, Performing, and Result Tracking and Measurement
  - Topic of last years SSTC Plenary presentation on April 22nd 2009
    - www.stewart-priven.com/publications.htm
  - Compliant with ‘IEEE 1028™-2008 for Inspections’
  - Provide rigor to Inspection Process for:
    - Correct & Complete Execution
    - Consistency between Inspection teams, organizations, projects, locations
    - Repeatable Performance
    - Auditable and actionable results, management reports
  - Net project saving estimate provided before project commitment
  - ROI and savings estimates for individual Inspections of Requirements and Design, as well as Code

- Both technologies target pre-code high defect insertion points
  - Contract, Requirements, Architecture, Interfaces, Design

Inspections - Peer Reviews

- Over time, each term has become ambiguous
- Many times the two terms are used interchangeably

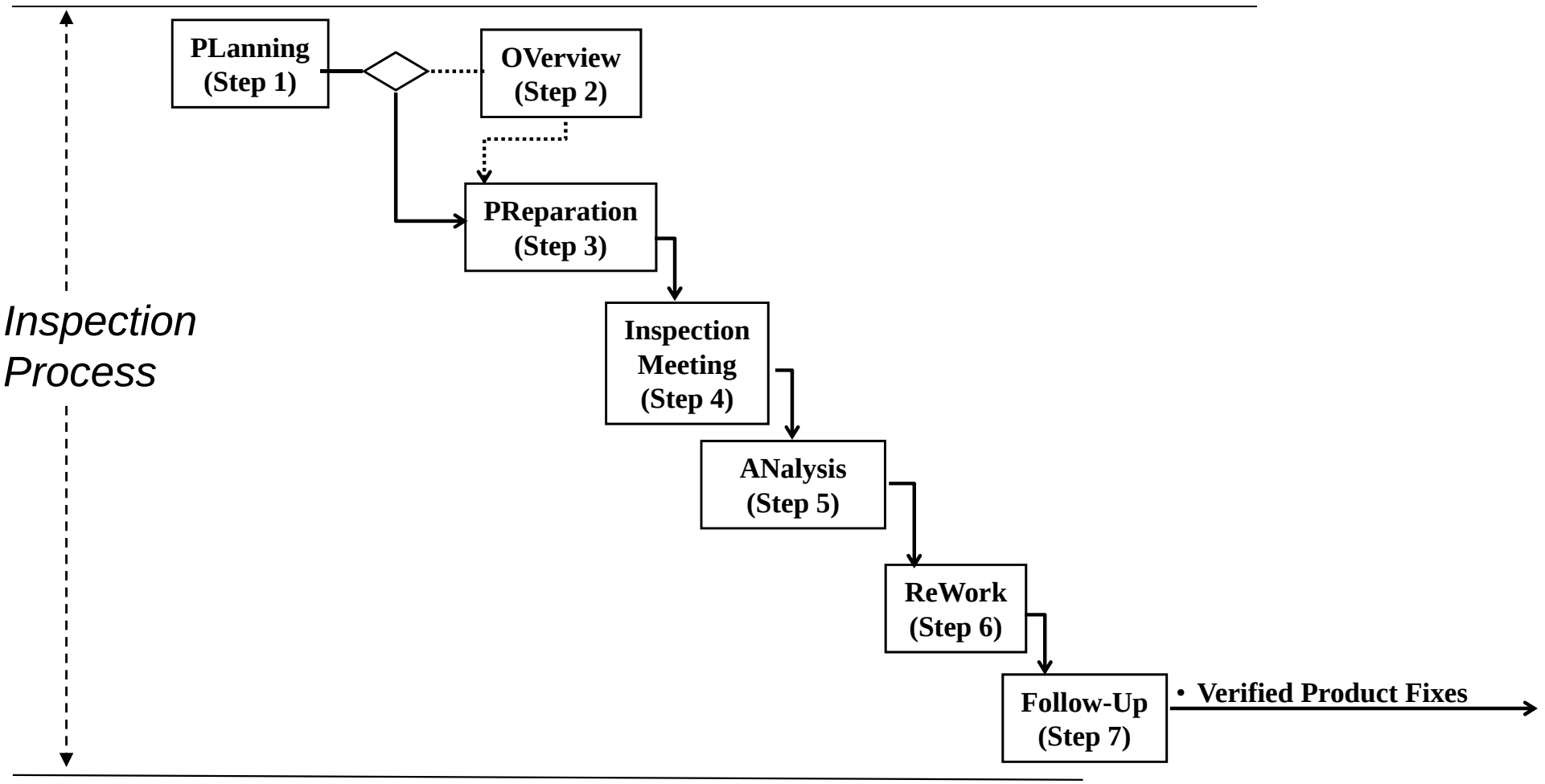
Stewart-Priven believe:

- Inspections are a rigorous form of Peer Reviews
- Peer Reviews are not necessarily Inspections
  - Peer Reviews may or may not be Inspections

- Key characteristics of effective Inspections:
  1. Defined by 'IEEE Std. 1028™-2008 for Inspections' (section 6)
     - Incorporate rigorous 'data-based' analysis (initially done by IBM in mid-70s)
     - Limits apply to material size, team size, material rates, Insp. Mtg. length
  2. Objective is 'removal' of major defects
     - not just finding defects, or removal of minor defects
  3. Paraphrasing by Reader's role, on all 'prepared' target material
  4. Real-time team synergism
     - Additional defects: +28% text; +55% code (Michael Fagan, sd&m Conference 2001)
  5. Computerized Inspection tools (for correct, consistent, repeatable execution)
  6. Upper management has implementation responsibilities (e.g., for pitfall avoidance)

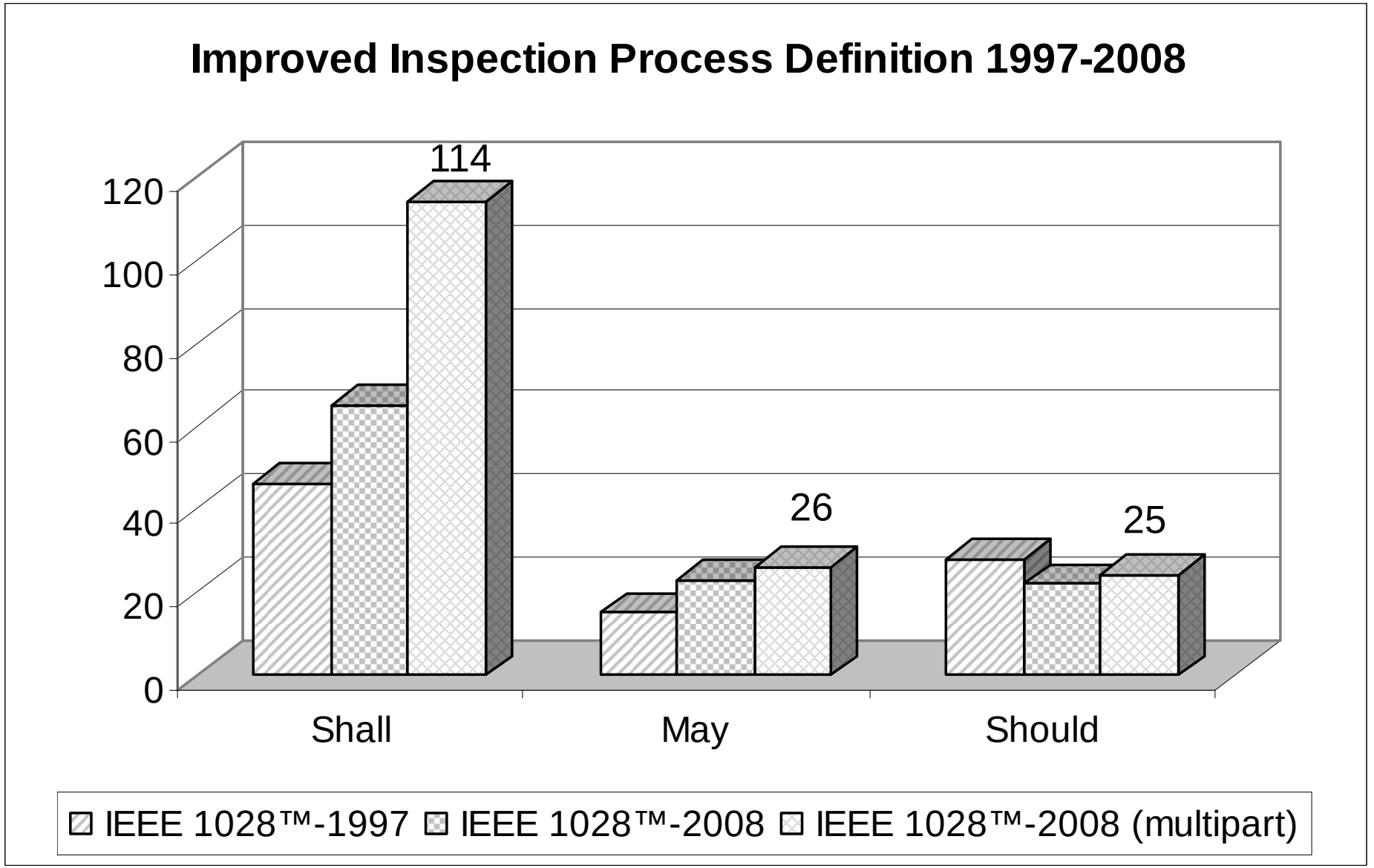
Inspection Process Flow

Inspection Objective: Find and Fix Product Defects



Consistent with IEEE Standard 1028™-2008 for Inspections
(IEEE - Institute of Electrical and Electronics Engineers, Inc.)

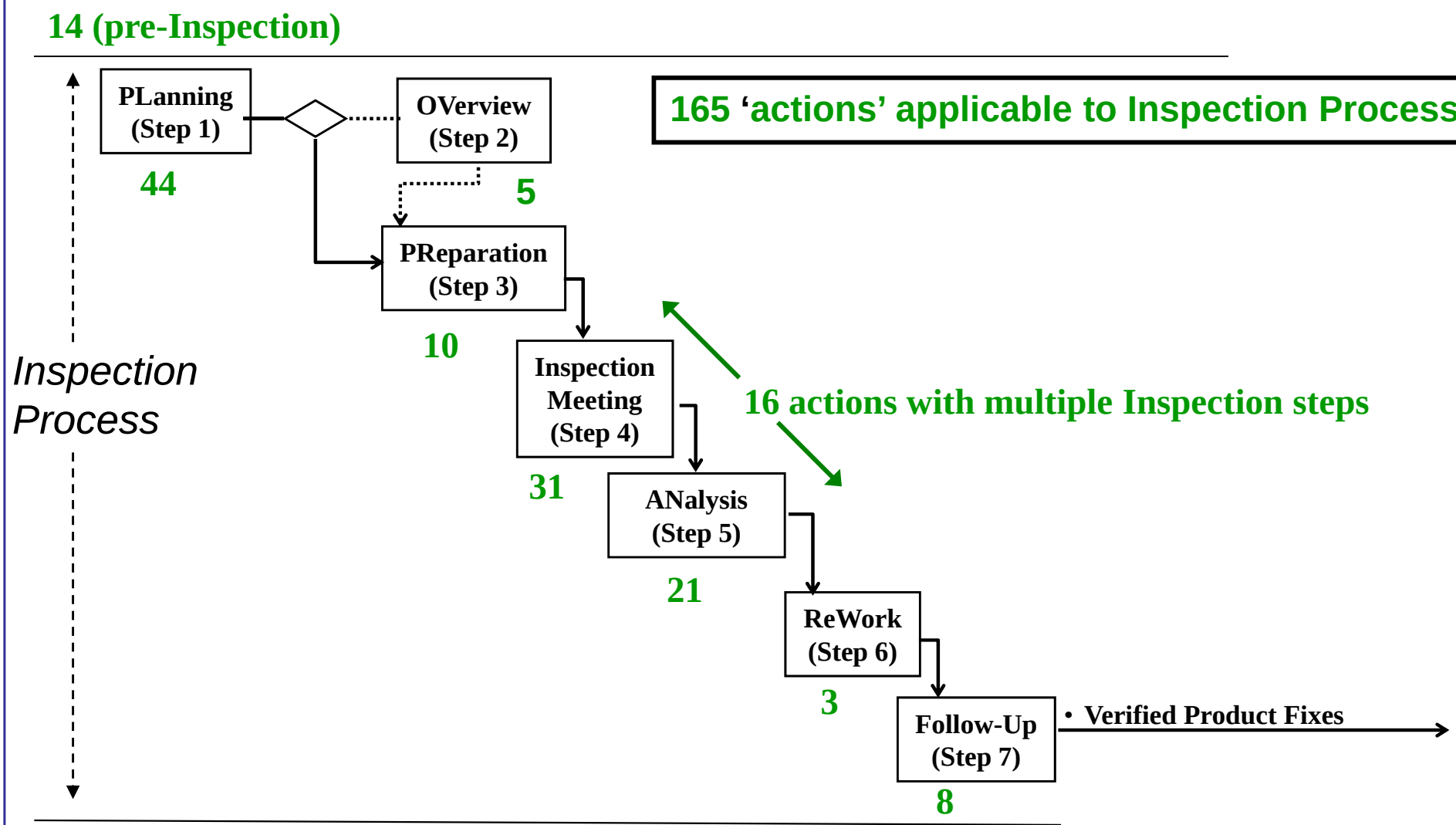
'IEEE Std. 1028™-2008 for Inspections' (section 6)



'Shall' (required) 'May' (alternative to Shall) 'Should' (recommended)

2008 Inspection Standard 'Process Actions'

Inspection Objective: Find and Fix Product Defects



Consistent with IEEE Standard 1028™-2008 for Inspections
(IEEE - Institute of Electrical and Electronics Engineers, Inc.)

2008 Inspection Standard 'Role Actions'

Inspection Objective: Find and Fix Product Defects

14 (pre-Inspection)

PLanning (Step 1) — **44**

OVerview (Step 2) — **5**

PReparation (Step 3) — **10**

Inspection Meeting (Step 4) — **31**

ANalysis (Step 5) — **21**

ReWork (Step 6) — **3**

Follow-Up (Step 7) — **8**

- Verified Product Fixes

165 actions applicable to Inspection Process

127 actions applicable to Inspection team

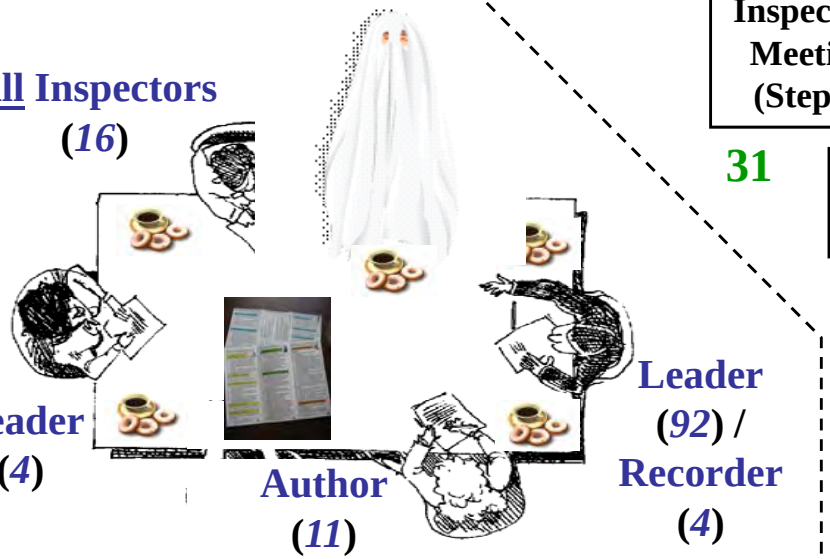
31 actions applicable to Management's role

7 actions applicable to Champion's role

16 actions with multiple Inspection steps

(*127*) actions

All Inspectors (*16*)



Reader (*4*)

Author (*11*)

Leader (*92*) / Recorder (*4*)

13 (post-Inspection)

Consistent with IEEE Standard 1028™-2008 for Inspections
(IEEE - Institute of Electrical and Electronics Engineers, Inc.)

Ensuring Supplier Compliance to Inspections

Inspection Compliance Matrix

Concept:

1. Candidate suppliers identify specific capabilities during RFP bid process
   - Acquirer (e.g., Govt.) Go/No-go
2. Supplier capabilities then verified by Acquirer's Expert as part of bid process
   - Acquirer Go/No-go
3. Supplier must demonstrate capability to produce ongoing, actionable and auditable justifiable evidence throughout contract performance
   - Acquirer Go/No-go before contract award
4. Post-award performance monitoring, throughout development

Inspection Compliance Matrix – part 1 of 4
Parsing the Inspection Standard

line #	3/30/10 Para	insp step	role	IEEE Std. 1028™-2008 for Inspections (Actions) [Action Clarification Text in brackets]	Action Type ShL	May	ShD
1	TOTALS >			165	114	26	25
164	**6.8**			**DATA COLLECTION**			
165	6.8	7	M	Inspections shall54a provide data for the analysis of the quality of the software product	54a		
166	6.8	7	M	Inspections shall54b provide data for the effectiveness of the acquisition, supply, development, operation and maintenance processes	54b		
167	6.8	5	M	Inspections shall54c provide data for the effectiveness and the efficiency of the inspection itself	54c		
168	6.8	8	M	data from the author and inspectors shall55 NOT be used to evaluate the performance of individuals	55		
169	6.8	4	L	anomalies identified at an inspection meeting shall56 be classified in accordance with 6.8.1, 6.8.2, and 6.8.3 [anomaly classification, categories and ranking]	56		
170	6.8	4	L	Inspection data shall57a contain the identification of the software product	57a		
171	6.8	4	D	Inspection data shall57b contain the date and time of the inspection	57b		
172	6.8	4	L	Inspection data shall57c contain the inspection team	57c		
173	6.8	4	L	Inspection data shall57d contain the preparation and inspection times	57d		
174	6.8	5	L	Inspection data shall57e contain the volume [size] of the materials inspected	57e		
175	6.8	5	L	Inspection data shall57f contain the disposition of the inspected software product	57f		
176	6.8	8	M	Capture of inspection data shall58 be used to optimize local guidance for inspections.	58		
177	6.8	8	M	Management of inspection data requires a capability to enter, store, access, update, summarize, and report classified anomalies	94		
178	6.8	8	M	Frequency and types of inspection analysis reports, and their distribution, are left to local standards and			95

Totals

Section 6.8 (Data Collection) of Standard

Parsing each shall, may, should

Assigning ID # to each shall, may, should

Decomposing multi-part actions

Identifying Inspection Role

Identifying Inspection Step #

Identifying where ‘Action’ additions needed (ID# = 9x; e.g., 94, 95)

Inspection Compliance Matrix – part 2 of 4
Recommended Implementation

line #	3/30/10 Para	insp step	role	IEEE Std. 1028™-2008 for Inspections (Actions) [Action Clarification Text in brackets]	Action Type ShL	May	ShD	Action Change	Rec.Implementation Training	Tools	Process	other
1	TOTALS >			165	114	26	25	37	139	**82**	138	0
164	**6.8**			**DATA COLLECTION**								
165	6.8	7	M	Inspections shall54a provide data for the analysis of the quality of the software product	54a				x	x	x	
166	6.8	7	M	Inspections shall54b provide data for the effectiveness of the acquisition, supply, development, operation and maintenance processes	54b				x	x	x	
167	6.8	5	M	Inspections shall54c provide data for the effectiveness and the efficiency of the inspection itself	54c				x	x	x	
168	6.8	8	M	data from the author and inspectors shall55 NOT be used to evaluate the performance of individuals	55				x		x	
169	6.8	4	L	anomalies identified at an inspection meeting shall56 be classified in accordance with 6.8.1, 6.8.2, and 6.8.3 [anomaly classification, categories and ranking]	56							
170	6.8	4	L	Inspection data shall57a contain the identification of the software product	57a				x	x	x	
171	6.8	4	D	Inspection data shall57b contain the date and time of the inspection	57b				x	x	x	
172	6.8	4	L	Inspection data shall57c contain the inspection team	57c				x	x	x	
173	6.8	4	L	Inspection data shall57d contain the preparation and inspection times	57d				x	x	x	
174	6.8	5	L	Inspection data shall57e contain the volume [size] of the materials inspected	57e				x	x	x	
175	6.8	5	L	Inspection data shall57f contain the disposition of the inspected software product	57f				x	x	x	
176	6.8	8	M	Capture of inspection data shall58 be used to optimize local guidance for inspections.	58				x		x	
177	6.8	8	M	Management of inspection data requires a capability to enter, store, access, update, summarize, and report classified anomalies	94			add a shall		x		
178	6.8	8	M	Frequency and types of inspection analysis reports, and their distribution, are left to local standards and			95	add a should		x		

'Recommended' Implementation

- Enhancements
- Most are text clarifications

Inspection Compliance Matrix – part 3 of 4
Supplier provided Implementation

1028-2008 | Supplier Map | Insp. Expert | A-Author C-Champion D-RecorDer I-Inspectors L-Leader M-Management R-Reader(paraphraser) 0-pre-inspect 8-post-inspect

line #	3/30/10 Para	insp step	role	IEEE Std. 1028™-2008 for Inspections (Actions) [Action Clarification Text in brackets]	Action Type ShL	May	ShD	Action Change	Rec.Implementation Training	Tools	Process	other	Supplier Implementation Training	Tools	Process	other	none
1	TOTALS >			165	114	26	25	37	139	**82**	138	0	0	0	0	0	0
164	**6.8**			**DATA COLLECTION**													
165	6.8	7	M	Inspections shall54a provide data for the analysis of the quality of the software product	54a				x	x	x						
166	6.8	7	M	Inspections shall54b provide data for the effectiveness of the acquisition, supply, development, operation and maintenance processes	54b				x	x	x						
167	6.8	5	M	Inspections shall54c provide data for the effectiveness and the efficiency of the inspection itself	54c				x	x	x						
168	6.8	8	M	data from the author and inspectors shall55 NOT be used to evaluate the performance of individuals	55				x		x						
169	6.8	4	L	anomalies identified at an inspection meeting shall56 be classified in accordance with 6.8.1, 6.8.2, and 6.8.3 [anomaly classification, categories and ranking]	56												
170	6.8	4	L	Inspection data shall57a contain the identification of the software product	57a				x	x	x						
171	6.8	4	D	Inspection data shall57b contain the date and time of the inspection	57b				x	x	x						
172	6.8	4	L	Inspection data shall57c contain the inspection team	57c				x	x	x						
173	6.8	4	L	Inspection data shall57d contain the preparation and inspection times	57d				x	x	x						
174	6.8	5	L	Inspection data shall57e contain the volume [size] of the materials inspected	57e				x	x	x						
175	6.8	5	L	Inspection data shall57f contain the disposition of the inspected software product	57f				x	x	x						
176	6.8	8	M	Capture of inspection data shall58 be used to optimize local guidance for inspections.	58				x		x						
177	6.8	8	M	Management of inspection data requires a capability to enter, store, access, update, summarize, and report classified anomalies	94			add a shall		x							
178	6.8	8	M	Frequency and types of inspection analysis reports, and their distribution, are left to local standards and			95	add a should		x							

- Legend:
  - Standard
  - Supplier
  - Expert
  - Roles

Supplier provided Implementation capability

5th column added – None

Inspection Compliance Matrix – part 4 of 4
Action Cross-Reference

Action Cross Reference

1028-2008 | Supplier Map | Insp. Expert | A-Author C-Champion D-RecorDer I-Inspectors L-Leader M-Management R-Reader(paraphraser) 0-pre-inspect 8-post-inspect

line #	3/30/10 Para	insp step	role	IEEE Std. 1028™-2008 for Inspections (Actions) [Action Clarification Text in brackets]	Action Type ShL	May	ShD	Action Change	Rec.Implementation Training	Tools	Process	other	Supplier Implementation Training	Tools	Process	other	none	Action X-REF and Notes
1	TOTALS >			165	114	26	25	37	139	**82**	138	0	0	0	0	0	0	08=65/23/22, 97=46/15/28
164	**6.8**			**DATA COLLECTION**														
165	6.8	7	M	Inspections shall54a provide data for the analysis of the quality of the software product	54a				x	x	x							ref Mandatory 2
166	6.8	7	M	Inspections shall54b provide data for the effectiveness of the acquisition, supply, development, operation and maintenance processes	54b				x	x	x							ref Mandatory 2
167	6.8	5	M	Inspections shall54c provide data for the effectiveness and the efficiency of the inspection itself	54c				x	x	x							ref May 1
168	6.8	8	M	data from the author and inspectors shall55 NOT be used to evaluate the performance of individuals	55				x		x							
169	6.8	4	L	anomalies identified at an inspection meeting shall56 be classified in accordance with 6.8.1, 6.8.2, and 6.8.3 [anomaly classification, categories and ranking]	56													
170	6.8	4	L	Inspection data shall57a contain the identification of the software product	57a				x	x	x							ref shall 53d
171	6.8	4	D	Inspection data shall57b contain the date and time of the inspection	57b				x	x	x							
172	6.8	4	L	Inspection data shall57c contain the inspection team	57c				x	x	x							ref shall 53b
173	6.8	4	L	Inspection data shall57d contain the preparation and inspection times	57d				x	x	x							ref shall 53c
174	6.8	5	L	Inspection data shall57e contain the volume [size] of the materials inspected	57e				x	x	x							ref shall 53e
175	6.8	5	L	Inspection data shall57f contain the disposition of the inspected software product	57f				x	x	x							ref shall 53i
176	6.8	8	M	Capture of inspection data shall58 be used to optimize local guidance for inspections.	58				x		x							
177	6.8	8	M	Management of inspection data requires a capability to enter, store, access, update, summarize, and report classified anomalies	94			add a shall		x								
178	6.8	8	M	Frequency and types of inspection analysis reports, and their distribution, are left to local standards and			95	add a should		x								

3-Stage / 8-Step Auditable Performance Based SW Acquisition Process

Initial Capability Assessment (Stage 1)

1 **Require** IEEE Std. 1028™-2008 (sec.6) Inspection compliance during Acquisition proposal bid response

2 Provide Inspection Compliance Matrix to supplier bidders

3 Perform gap analysis and map project's Inspection (or Peer-Review) capabilities to Compliance Matrix

4 Evaluate mapping and Recommend Go/No-Go

◇ Go – capabilities mapped

Process Assessment (Stage 2)

5 Evaluation of Supplier Inspection Process for:

- Educated Management
  - Ensure all inspection pitfalls[1] mitigated
- Trained Inspectors
- Computerized Inspection Tools [2]

Go/No-Go Recommendation

◇ Go - process verified

Execution Assessment (Stage 3)

6 IEEE Std. 1028™-2008 Compliant Inspection process **execution**

7 Auditable & Actionable performance-based **Results** captured by Inspection-Tool reports

◇ Go - execution confirmed

8 **contract awarded - performance**

- Monitor Inspection tool reports for process conformance and action completion throughout Development
- Provide periodic assessment recommendations to Acquirer

Disciplined Development Process (Inspection Std.)

Meaningful Metrics (Inspection Tools)

Legend: Acquirer | Supplier | Acquirer's 3rd party expert

1 Stewart, Roger & Priven, Lew. "How to Avoid Software Inspection Failure and Achieve Ongoing Benefits." CROSSTALK Magazine Jan. 2008

2 Stewart, Roger & Priven, Lew. "Management's Inspection Responsibilities and Tools for Success." CROSSTALK Magazine Mar/Apr. 2009

Capability Mapped - Process Verified - Execution Confirmed

Acquirer's checklist (pre-contract award)

1028-2008 | Supplier Map | Insp. Expert | A-Author C-Champion D-RecorDer I-Inspectors L-Leader M-Management R-Reader(paraphraser) 0-pre-inspect 8-post-inspect

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164	**6.8**			**DATA COLLECTION**																
165	6.8	7	M	Inspections shall54a provide data for the analysis of the quality of the software product	54a				x	x	x									
166	6.8	7	M	Inspections shall54b provide data for the effectiveness of the acquisition, supply, development, operation and maintenance processes	54b				x	x	x									
167	6.8	5	M	Inspections shall54c provide data for the effectiveness and the efficiency of the inspection itself	54c				x	x	x									
168	6.8	8	M	data from the author and inspectors shall55 NOT be used to evaluate the performance of individuals	55				x		x									
169	6.8	4	L	anomalies identified at an inspection meeting shall56 be classified in accordance with 6.8.1, 6.8.2, and 6.8.3 [anomaly classification, categories and ranking]	56															
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171	6.8	4	D	Inspection data shall57b contain the date and time of the inspection	57b				x	x	x									
172	6.8	4	L	Inspection data shall57c contain the inspection team	57c				x	x	x									
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175	6.8	5	L	Inspection data shall57f contain the disposition of the inspected software product	57f				x	x	x									
176	6.8	8	M	Capture of inspection data shall58 be used to optimize local guidance for inspections.	58				x		x									
177	6.8	8	M	Management of inspection data requires a capability to enter, store, access, update, summarize, and report classified anomalies	94			add a shall		x										
178	6.8	8	M	Frequency and types of inspection analysis reports, and their distribution, are left to local standards and			95	add a should		x										

Computerized Inspection Tools

- Correct & Complete Inspection Execution
- Repeatable Results for Labor Savings & High Quality Products
- Consistency across Inspection Teams, Groups & Locations

Rigor

- Measurement and Comparison of actual defect removal by Inspection and Testing vs. Quality Plan objectives
- Facilitates Management Buy-in
  - Inspection Tools for Project Planning and Savings Estimation
    - Pre-Commitment
    - Support 'What-If' Project scenarios

Inspection Tool Use

Inspection Objective: Find and Fix Product Defects

Inspection Planning Tool-Set

PLanning (Step 1)

OVerview (Step 2)

PReparation (Step 3)

Inspection Meeting (Step 4)

ANalysis (Step 5)

ReWork (Step 6)

Follow-Up (Step 7)

Inspection Process

Inspecting Tool-Set

Auditable & Actionable performance based results

Preliminary Management Report

- Verified Product Fixes
- Product Configuration Control
- Final Report for Management Review and Action
- Database Update & Archive

Inspection Tracking & Measurement Tool-Set

Consistent with IEEE Standard 1028-2008 for Inspections
(IEEE - Institute of Electrical and Electronics Engineers, Inc.)

Portability of 8-Step Auditable Acquisition Process

- Could be applied to other Standards or Process
  - Standard/Process Expert
  - Compliance Matrix Development
- Matrix Compliance provides;
  - Supplier Execution Rigor
  - Auditable Performance Based Results from Supplier
    - e.g., tool generated
- Inspections can be used to examine other Standards and Processes

Achieve Auditable Performance Based Acquisition Now

Use 8-step process ***first*** with the 2008 Inspection Standard:

- Addresses current Schedule and Quality problems
- Addresses up-front defect insertion points (e.g., Reqts, Design)
- Allows moving to true Auditable Performance Based Acquisition TODAY!

Auditable Performance Based Acquisition can now be consistent across all DoD Programs!

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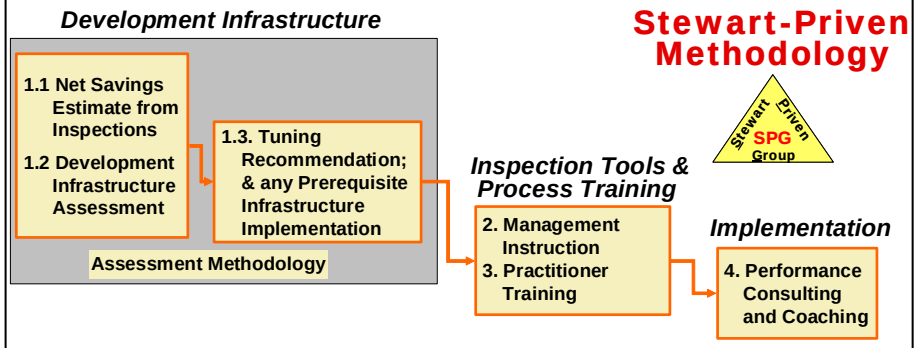

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What is the Industry View of Inspections

- **'The data in support of the quality, cost and schedule impact of inspections is overwhelming. They are an indispensable part of engineering high-quality software.**' *Steve McConnell - "IEEE Software Jan/Feb 2000, Best Influences on Software Engineering over past 50 years"*

- 'Inspections are surely a key topic, and with the right instrumentation and training they are **one of the most powerful techniques for defect detection**. They are both effective and efficient, especially for up-front activities. In addition to large-scale applications, we are applying them to smaller applications and incremental development.' *Chris Ebert - "IEEE Software Jan/Feb 2000, Best Influences on Software Engineering over past 50 years"*

- 'Inspection repeatedly has been demonstrated to yield up to a **10 to 1 return on investment.** . . .depressingly few practitioners know about the 30 year old technique of software inspection. Even fewer routinely perform effective inspections or other types of peer reviews.' "*Karl Wiegers - "The More Things Change, Better Software, Oct. 2006"*

- 'The software community has used Inspections for almost twenty eight years. During this timeframe Inspections have **consistently added value for many software organizations.** Yet for others, Inspections never succeeded as well as expected, primarily because these organizations did not learn how to make Inspection both effective and low cost.' *Ron Radice - "High Quality Low Cost Software Inspections, 2002 Paradoxicon Publishing"*

- **'Formal inspections can raise the [defect] removal efficiency to over 95%.** But part of the problem here is that not a lot of companies know how to use these things.' *Capers Jones, Chief Scientist, SPR – "Computer Aid Inc. July 2005"*

- 'I continue to be amazed at the number of software development organizations that do not use this powerful method [inspections] to improve quality and productivity.' *Ed Weller - "Jan. 2002, Calculating the Economics of Inspections"*

About Stewart-Priven

- Roger Stewart is co-founder and Managing Director of the Stewart-Priven Group. He is an experienced Lead Systems Engineer and Program Manager in both government and commercial system development – including Systems Engineering, Software Development, System Integration, System Testing, and Process Improvement.
- Previously, Stewart taught the Fagan Defect-Free Process for Michael Fagan Associates (8 years) after spending 31 years with IBM's Federal Systems Division, (now part of Lockheed-Martin) managing and developing systems for the FAA Air Traffic Control, Air Force Satellite Command & Control, NASA On-Board Space Shuttle, NAVY Light Airborne Multi-Purpose System (LAMPS Helicopter); and in Commercial Banking, Telecommunication and Networking systems.
- Roger has a BS in Mathematics from Cortland University.

- Lew Priven is co-founder and Managing Director of the Stewart-Priven Group. He is an experienced executive with management and technical background in system and software development, software quality training, management development training and human resource management.
- Previously, Priven managed the IBM team that developed the inspection process, taught the Fagan Defect-Free Process for Michael Fagan Associates (8 years), and was Vice-President of Engineering & Application Development at General Electric Information Services, Vice President of Application Development for IBM's Application Systems Division, Director of Operations & Development for the IBM Information Network, Vice President of Information Technology & Human Resources for Satellite Business Systems.
- Lew has a BS in Electrical Engineering from Tufts University and an MS in Management from Rensselaer Polytechnic Institute.

Acronyms

- number
APV – approval
CMM – Capability Maturity Model
CMMI – Capability Maturity Model Integration
Con - confirmed
Des - Design
DHS – Department Homeland Security
DoD – Department of Defense
e.g. – for example
Govt. – Government
IBM – International Business Machines
IEEE – Institute of Electrical & Electronic Engineers, Inc.
Insp. - Inspection
ISO – International Organization for Standardization
Mgt – Management
Mtg - Meeting
Para – paragraph
Rec - Recommended
Req – Requirements
RFP – Request for Proposal
ROI – Return on Investment
ShD – should
ShL – shall
SSTC – Systems & Software Technology Conference
Std. – Standard
SW – Software
SwA – Software Assurance
TRW – defense contractor acquired by Northrop Grumman in 2002
ut – unit test
Ver - Verified
vs. - versus
X-Ref – Cross Reference